

## ABSTRACT

In response to these and other needs, the present invention provides a virtual storage system that generally uses larger segmentations, but has the ability to divide the large segments into smaller sub-segments during data movement operations. The mapping has large segments except for those segments undergoing data movement. For those segments being moved, the mapping uses the smallest segment size possible, namely, a single disk block. The present invention provides a method and system having this hierarchy of segment sizes, a large segment for normal uses and breaking the large segment into single disk blocks during data movement. In this way, the administration costs are generally low, but latencies caused by the movement of large data blocks are avoided. The hierarchy of segment sizes is accomplished through a distributed virtual storage system having a controller that manages a mapping table and multiple agents that present the mapping to devices on the network. The present invention adapts the mapping table to include a first and a second storage locations and a bit map of the actual storage segments. When the first storage location is occupied during a move operation, the controller causes other I/O operations to occur at the second location. The bitmap stores, on a block by block basis, the blocks at the second location affected by the I/O operations. During future operations, the mapping table maps to first the storage location, except for the block indicated in the bitmap. The bitmap is stored only by the controller and is sent out to the agents as part of an instruction to read from parts of first storage location not contained in the bitmap and parts of the second storage location contained in the bitmap.